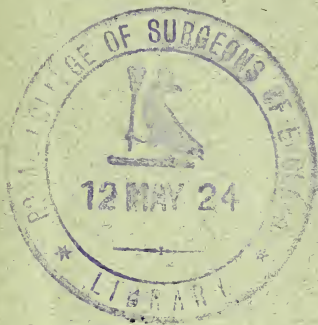
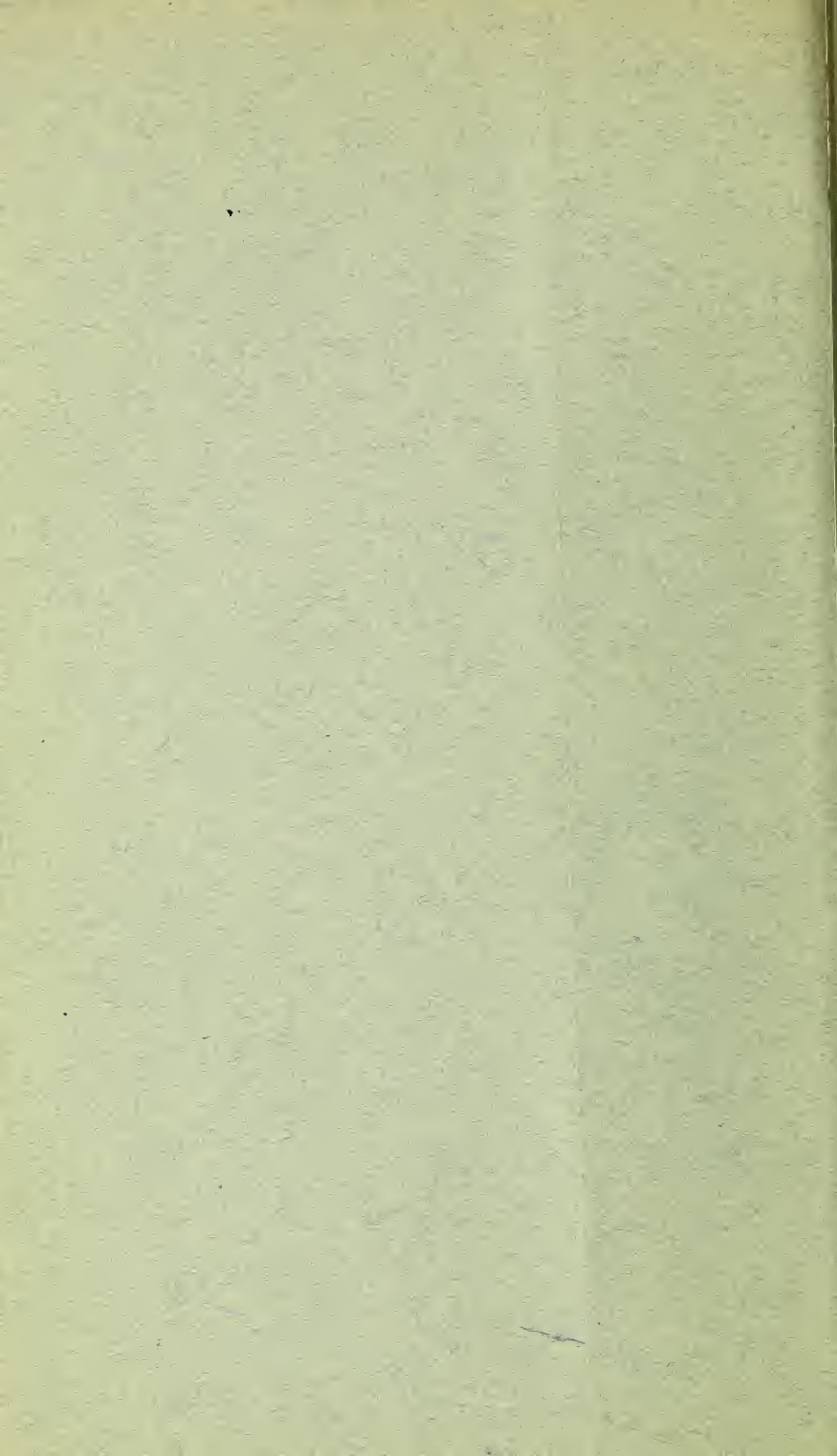


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with the Author's Compliments.

R. Anderson.





*Address delivered before the Congress
of the British Medical Association in July 1895*

ON ART IN ITS RELATION TO ANATOMY.

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THE object of the paper I have the honour to read to-day is mainly demonstrative and only in a minor degree argumentative. The three considerations I propose to lay before the Section are, first, the Debt that Anatomy owes to Art; secondly, the Advantages that Artists may derive from a Scientific Knowledge of Anatomy; and, lastly, the Extent to which Artistic Methods of Observation may Profit Ourselves in the Medical Study of Anatomy.

1. The consideration of the debt that anatomy owes to art will occupy the greater part of the time at our disposal, for I shall venture to give a brief history of the rise of artistic illustration in its application to anatomical teaching, in order to bring under the notice of those of our body who have had no leisure to devote to the subject a collection of illustrated anatomical treatises from the time of Berengario da Carpi to the present day, and to say a few words concerning the evidences of anatomical observation by artists in the period antecedent to what we should now term "anatomical illustration."

EARLY ANATOMY AND EARLY ART.

Anatomical knowledge of a certain kind is as old as art itself, but the early knowledge was vitiated by imperfect observation and blind reverence for misleading traditions. Anatomical illustration, too, was employed wherever the name of anatomy was held in respect, as in Egypt, in Greece, in India, and even in China; and models, showing more or less inaccurately the relative positions of the heart and lungs and other large organs, were used for purposes of demonstration by orthodoxy and quackery alike. These crude efforts, however, may be passed over, for it is not to mere caricatures of visceral anatomy that we must turn for examples of art, but to something that was pure art without scientific aim, art that showed in the highest degree two of the qualities upon which scientific progress must depend, accurate observation, and exact record of the thing observed.

The history of art and that of anatomy are by no means contemporary. While the art of the sculptor was producing its grandest masterpieces, medicine remained mystical, empirical, and, perhaps worst of all, dogmatic; and anatomy, the basis of all true medical science, was, even for a mind like that of Hippocrates, a collection of imperfectly-noted facts tempered with time-honoured fictions. In the midst

of all the medical darkness, it was the artist alone who found light to study the anatomy of man. More than a century before the school of Alexandria had, under Herophilus and Erasistratus, inaugurated the study of human anatomy by dissection, the dissection, it is said, not only of the dead subject but even of living men, Pheidias, the great master of the age of Pericles, and a contemporary of Hippocrates himself, had achieved what appears to us now the very consummation of truth and beauty in the representation of the human figure.

THE GREEK SCULPTOR AS ANATOMIST.

Let us look at the noble figures of the Theseus and of the Ilyssus (to take the most familiar of the many names given to the masterpieces of the Parthenon), and we shall see a very triumph of truth, expressed with ineffable nobility by the mind and hand of genius. It is not enough to merely represent Nature as we may chance to find her in any given subject. Nature is full of imperfections, but all that is beautiful is there for him who has the eye to distinguish perfection in the midst of faults, and the skill to record it in such a way as to teach the rest of the world. This is what Pheidias did, what some of his predecessors and contemporaries aimed at, and what Michael Angelo with all his power and all his science failed to do.

Let the most profound anatomist of our day examine these magnificent fragments and try to discover an error in science, or let the greatest artist try to point out a line or a contour that could be altered without loss, if he can. Here is an anatomy, not studied in the dissecting-room, as was that of Michael Angelo, but instinct with life and as free from omission as from error. There is no impressionistic scamping here; every touch is workmanlike and thorough, but it is from the hand of a workman who knew that all dignity and beauty lay in Nature, and who found them. No photograph of the finest living model could give us what we see here, for no model is perfect; but the artist has created grand types by virtue of a wide and discriminating research of Nature—by what may be termed “artistic selection” in opposition to “natural selection.” The Discobolus of Myron, which preceded the Theseus and Ilyssus, is almost as accurate in anatomical forms but infinitely inferior in genius, for it is realism without soul. The same may be said of a higher work, the Borghese warrior (Fighting Gladiator) of Agasias (400 B.C.), which is the very idealisation of animal strength in action, and the Farnese Hercules, which shows the huge brawn of the athlete in repose. But a more difficult task has been achieved by the sculptor, probably Cresilas, a contemporary of Pheidias, who has caught the last effort of the fainting or dying man in the figure commonly known as the “Dying Gladiator.” In all of these, and in many others that might be named, art was wedded to Nature; but later on two meretricious rivals, convention and drama, were admitted into the atelier, and the decadence of art began. Take the vaunted group of the Laocoön, attributed to the Rhodian sculptors, Agesandros and his two sons, in the first or second century A.D. Grand and beautiful as it is, its perfection is marred by dramatic posing, faults of observation, and artificial laws of composition. Again, the figure of the standing Discobolus, attributed to Naucides—

which for our æsthetic sins is made a canon in nearly all our art schools—is full of weak conventions and faults of form, redeemed only by a certain nobility of pose and grace of action that hint at what the artist might have done had he followed the teachings of the great Nature that was at his doors.

THE DECADENCE.

The establishment of the school of Alexandria, less than a century after the death of Pheidias, should have done much to advance the knowledge of anatomy, and we know that under Erasistratus and Herophilus the dissection of the dead body was practised openly, but there was marvellously little harvest from such a broad and fertile field, and the culture of original observation in human anatomy rapidly declined, until in the second century of our era, when Galen, strongly imbued as he was with the spirit of research, was compelled to base his anatomical writings on the dissection of the lower animals, and taught nothing that could serve the cause of art. And down to the seventh century, although the Greek surgeons in Asia Minor had done something for surgery, anatomy remained at a standstill. Even the works of Galen were neglected from the end of the fifth century, and we come to that most dismal of all periods—the Middle Ages—when art was at its lowest ebb, when learning, represented chiefly by Jews and Arabs and a bigoted clergy, was opposed alike to scientific investigation and artistic culture. The magnificent toreutic art of Greece and its pale reflex in Rome dwindled away through the Byzantine period to be revived only with the advent of Cimabue and Giotto. In all this long and dreary period there was scarcely a ray of light, artistic or anatomical, and it was not until the thirteenth century that Frederick, the second Emperor of Germany, and King of the Two Sicilies, revived the study of anatomy by dissection. The first outcome of the new departure was the publication in 1316 of the first treatise on human anatomy, that of Mondino, better known by his Latinised name Mundinus.

THE REVIVAL OF ANATOMY.

Dissection was introduced into France at Montpellier in 1376, and it was by a French surgeon, Henri de Mondeville, who lived at the beginning of the fourteenth century, that anatomical diagrams were first used in Europe as a means of instruction. The drawings were probably traditional, and dealt only with anatomy from the Galenic standpoint, for Guy de Chauliac, the pupil of De Mondeville, who records their use, knew only the antique lore handed down by the Arab writers.

It was not, however, till the latter part of the fifteenth century that the initial stage of the anatomical revival was past, and then for the first time in history art and scientific anatomy went hand in hand. From this time we may formulate four periods of art in its relation to anatomy:—

1. The period of early association between artists and anatomists anterior to the publication of illustrated anatomical treatises: from the early part of the fifteenth century.

2. A period of accurate and artistic illustration of anatomy by wood engraving, covering the second quarter of the sixteenth century.

3. A period of artistic illustration by engravings in copper, terminating in the second decade of the present century.

4. The modern period of multiplied technical resource in reproduction, with painstaking efforts to secure clearness of representation.

THE EARLY ASSOCIATION OF ARTISTS AND ANATOMISTS.

The first really important application of art to medicine belongs to a period no earlier than the fifteenth century, and brings us into contact with one of the most versatile figures in history—Lionardo da Vinci, painter, sculptor, architect, scientist, poet, and musician. It was he who, first amongst artists, judged it profitable to place himself *en rapport* with the representatives of medical science. It is known that he became intimately associated with the physician Marcantonio della Torre, of Ferrara and Padua, and that he made for him numerous drawings to illustrate an anatomical treatise, but the untimely death of Marcantonio in 1506 or 1512 dissolved a



Fig. 1.—From sketches by Lionardo da Vinci.

connection which under better auspices might have raised the anatomist to the eminence afterwards occupied by Vesalius. As it was, the great work remained unfinished, all that had been written was lost, and with it disappeared the drawings of Lionardo. Nearly all that we now possess of the anatomical work of the painter is a small series of representations of the bones and muscles, but these, if not scrupulously exact, yet stand unrivalled in vigour and expressiveness, and the scientific spirit of the design is manifested by the addition of analytical diagrams framed for the demonstration of muscular action—a subject on which the artist is said to have written a special treatise, another lost treasure. It may be worth while to call attention to a curious outline forming suite with these, a vertical section of two figures in the act of sexual congress. The aim of the sketch

was purely physiological, and the chief interest of the drawing lies in the fact that, unlike in the companion pictures, which were undoubtedly taken from actual dissections, the structural features were derived from the Galenic descriptions—a fault compromising to the reputation of Marcantonio, if he is to be held responsible for the scientific errors of his pupil or associate.

The period of Lionardo and of the succeeding generation was a glorious one in the history of art, for while the great Tuscan was yet in the vigour of his age, a reflex of his many-sided genius appeared in Michael Angelo Buonarrotti, at once painter, sculptor, architect, engineer, and poet. The younger man had reached the zenith of his fame when his predecessor, full of years and honours, expired in the arms of the monarch whose graceful tribute to genius did more to immortalise his royal memory than the Field of the Cloth of Gold or all the prodigal magnificence of a long unlucky reign.

Michael Angelo, like Lionardo, perceived at once the advantages to be derived from the association of art with anatomy. Realdo Colombo became his Marcantonio; and for twelve years, first in Florence, then in Rome, he devoted himself to the study of the human body. The results are manifest, and perhaps too plainly, in all his works. His statues of David, the Captives, and many others, are wonderful evidence of anatomical knowledge, though often defective in proportion and too suggestive of the dissecting room, but the sculptor and painter gave nothing to medical science. The work of his friend Colombo appeared in 1559, without a single illustration beyond a woodcut frontispiece of a dissecting-room scene, and there is no record of any drawings by Michael Angelo like those which Lionardo is said to have executed for Marcantonio.

The third great star of the Renaissance, Rafaelo Santi, again painter, sculptor, and architect, won triumphs as enduring as those which fell to the lot of his rival and contemporary, but they were of a somewhat different nature. He was, perhaps, less an anatomist than either Lionardo or Michael Angelo, but fewer years were allotted to him for the consummation of his studies, for he passed away before he had ended the fourth decade of his brilliant career. It is nevertheless proved by some of his sketches not only that he comprehended the importance of the science, but that he was no mean proficient in those portions of it which are most essential to the painter.

To this constellation may be added the names of Pollajuolo, Baccio Bandinelli, Rosso de' Rossi, and Benvenuto Cellini. Of the first two we know little, except that they practised dissection, and some repulsively realistic anatomical sketches by Bandinelli have been preserved. Rosso de' Rossi, a late contemporary of Rafael, was the first artist who attempted to prepare a volume upon anatomy for the use of painters, but unfortunately he did not live to carry out his design. The one plate, containing representations of the bones and muscles, given to the world as an earnest of his good intentions, is, however, so rich in strength and fidelity that it has been mistaken for the work of Michael Angelo himself. Benvenuto Cellini attached himself to Guido Guidi (*Vidus Vidius*), whose book on anatomy was not published till long after his death, and to Berengario da Carpi, but it is uncertain whether he gave any assistance to either author.

So far the art of the fifteenth and the first half of the sixteenth centuries bore little relation to medicine, if we omit from consideration the drawings said to have been made by Lionardo. Whilst great painters left accurate record of all that their dissecting-room experiences had revealed, two of the most celebrated physicians of the age, Magnus Hundt, of Leipzig, and Lorenz Phryesen, of Colmar, found nothing better to illustrate their treatises than the anatomy of Galen. Phryesen, in a pretentious tome entitled *Spiegel der Artzney* (1518) gives us only a wretched caricature of the skeleton, a view of the abdominal and thoracic viscera that was probably a reminiscence of some half-hearted necropsy of a dog, one or two confused sketches of the brain, and a carefully executed picture of the august teacher seated in academical dignity before a meek disciple, who cringes bareheaded to receive with unfathomable faith and patience the flatulent pedantry enunciated from the magisterial chair.

ILLUSTRATION OF ANATOMICAL BOOKS BY WOOD ENGRAVING.

The second period, that of artistic illustration of anatomical, medical, and surgical works by wood engravings, began in the third decade of the sixteenth century with the appearance of a commentary upon the anatomical works of Mondino by Berengario da Carpi (1521), which was followed in the next year by a compendium by the latter author, who therein corrected many errors of his predecessor, and added much new material. Both of these books were embellished with woodcuts, a few of which, chiefly myological, were of much artistic beauty and moderate accuracy, while others were of a traditional character, and in accordance with the description of Galen and the Arab school. It is possible that Berengario received some artistic aid from Benvenuto Cellini, then in his early manhood. Nearly twenty years later further contributions of a very similar kind were made by Johann Eichmann or Dryander, a professor at Marburg, who issued an original composition upon the dissection of the body in 1537, with wood engravings not unlike those of Berengario; and in 1541 an edition of Mondino, in which many of the illustrations executed for the previous volume were utilised a second time.

Berengario and Eichmann did good service in the cause of anatomy, and prepared the way for a higher school that was destined to relegate that of Mondino to the Araf of the imperfect sciences. Berengario had half caught the idea of a genuine treatise upon the anatomy of man, based upon direct investigation, but the consummation of such a work was reserved for a far greater mind—that of the Belgian, Andreas Vesal.

VESALIUS.

The student of medicine of the present day, who recognises the name of Vesalius only in association with an unimportant little foramen in the base of the skull, is scarcely aware that it is to his precocious genius we owe the entire scheme of human anatomy, as a study involving precision of observation and description. Yet so it is, for to turn from the pages of his predecessors to the *De Humani Corporis Fabrica* of Vesal, is to step from the confusing glimmer of conjecture and tradition into light and order. Much, indeed, is here left incomplete, but all is prepared for completion; and it is to be especially remarked that, from the first, the great

teacher availed himself of the assistance of the painter and engraver, and directed their interpretations of the subject at every step. It is possible that he himself learned much in teaching his coadjutors, and it is certain that the value of his own labours was doubled by the aid derived from the skilled pencil which wrote his story in characters that all men could understand; it was, indeed, by means of pictorial broad sheets—a form of publication that appears to have been very prevalent in the sixteenth century, and perhaps earlier—that his work first became known, for six large plates engraved on wood, after the drawings of a pupil of Titian named Johannes Stephen van Calcar, appeared in 1538, in the form of *Fliegende Blätter*, before the author had completed his twenty-fourth year.

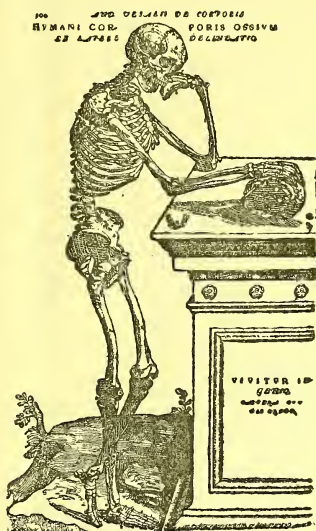


Fig. 2.—From Vesalius, *De Humani Corporis Fabrica*.

The *Magnum Opus* was published at Basle in 1543. To men of science it was a revelation, as an example of anatomical research upon a scale unprecedented both in magnitude and in minuteness; and to amateurs of art the volume has always been precious on account of the happy union of power and veracity in the designs, and the skill with which they have been transferred to wood by the unknown engraver. The drawings, with a few exceptions, convey the essential features of the subject with the smallest amount of apparent labour, and, unlike many of the illustrations of later works, they never digress from the object they were intended to serve, for although a little artistic fancy appears in the attitudes and attributes of some of the full-length figures, the cuts are in other respects as sober and practical as those which appear in the pages of Gray or Quain. In point of accuracy of detail there was considerable diversity in the various sections of the work. The most satisfactory presentments, as might have been conjectured, were those of the undissected body and of the bones

and muscles. The nude forms which display the surface markings and proportions are strikingly noble, and expressive, and leave nothing to be desired in correctness of outline. The skeletons and myological figures, inspired with life by the fancy of the artist, were freed from repulsiveness without sacrifice of the essential truths; but the drawings illustrative of the nervous system are amongst the least successful, although the dissector had prepared his material with skill and care.

It is not indeed to be expected that many of the cuts would display the minute indications of detail that are looked for in even the least ambitious manual of our day, but the main features were faithfully described and portrayed, and the work as a whole was a miracle of wide and original research, adorned with the best artistic judgment. It is difficult to say whether it was the illustrations or the text that exercised the stronger influence over the contemporaries and followers



Fig. 3.—From Vesalius.

of the author, but for a century afterwards the anatomists of Europe did little more than compose variations upon the conjoint triumphs of Vesal and Calcar. An "epitome" with enlarged cuts was published in the same year, and a second edition of the entire work appeared in 1555, nine years before the death of the writer. This revised edition is printed on better paper, and is preferred by collectors to the first.

A complete list of the works in which Vesal's illustrations were imitated, would be too long to offer in this place, but a few deserve a passing allusion. The first systematic treatise upon anatomy in England was a compendium by Thomas Geminus in 1645, in which the designs of Calcar were translated upon copper plates, losing nearly all their strength and beauty in the process. A smaller and later volume by John Bannister, entitled "The Historie of Man, sucked from the

plate now shown, for example, we see the entire form of a man in the foreground of a pastoral landscape, his calvaria hanging upon a withered branch above his head while his denuded dura mater turned towards the spectator constitutes the square inch of anatomy in the quarto page of engraving; and in another, a nude full length figure of a woman seated in a chamber of severely classical architecture, has no further object than to display the contour of the external genitals. Nevertheless except in the case of the muscles, which were execrably caricatured, the anatomy was for the most part fairly truthful, and it was evident that the author had carefully supervised the work of the engraver, for in many plates it may be seen that a portion of the block, probably where the first interpretation was unsatisfactory, has been cut out and replaced by a new and presumably better rendering.¹



Fig. 5.—Eustachius, *Tabulæ Anatomicæ Bart. Eustachii*.

EUSTACHIUS.

A far more serious competitor, however, of Vesal was the Italian physician Bartolomeo Eustachi, whose published work on the anatomy of the kidneys was an admirably thorough piece of original investigation. He, also, had many plates engraved to illustrate his anatomical writings, but only eight of these appeared during his life, in association with his *Opuscula Anatomica* in 1564. Thirty-nine other engravings, executed under his directions not later than 1552, remained unutilised until a hundred and forty years after his death, when they were at length published by Lancisi in

¹ It has been supposed that as the anatomical details in a few of these plates were confined to those portions of the block which had obviously been let in after the completion of the rest of the engraving, the woodcuts had originally been executed for a different purpose, and were merely adapted by Estienne. A careful examination of the series will, however, disprove this view.

1714, together with the original descriptions, under the title of *Tabulæ Anatomicae Bart. Eustachii*. Despite their prolonged repose in the Sleepy Hollow of the lumber rooms of Eustachi's unappreciative heirs, the pictures were so little behind the age when they were introduced to the world that edition after edition was called for, the demand ceasing only at the beginning of the present century. The representations were indeed in some respects even richer and more trustworthy in detail than those of Vesal; and although both drawing and engraving were feeble and unattractive, the scientific value of the plates was more than sufficient to compensate for their æsthetic defects.

ILLUSTRATIONS OF ANATOMICAL BOOKS BY COPPERPLATES.

The third period, extending from the middle of the sixteenth to the early part of the nineteenth century, may be termed that of artistic engraving on copper. It is, of course, well known that chalcography had been practised long anterior to this time—at least as early as 1461—and was employed with admirable effect by Mantegna before the end of the fifteenth century; but the few examples of the process that had appeared in medical books before the seventeenth century were of small artistic importance when compared with the contemporary work of the wood engraver.

Amongst the first of the new series stands the *Historia de la Composicion del Cuerpo Humano* (1556,) by Joan Valverde de Hamusco, a Spaniard, who had studied anatomy under Colombo and Eustachi. The illustrations to this work, attributed to a Spanish painter named Becerra, are mostly adaptations of the pictures of Vesalius, and are skilfully engraved on copper. One, however, is entirely new, and represents the figure of a man who, having just succeeded in divesting himself of his skin, stands in an attitude of dignified self-approbation, grasping the bloody knife in one hand whilst with the other he holds up to view his detached integuments, from the midst of which the flaccid cortex of his face gazes in feeble deprecation at the spectator. This offers a curious instance of the tendency manifested by the old anatomical artists to make the most of the subject from their own point of view.

The use of the wood engraving in the embellishment of anatomical works did not end during this latter half of the sixteenth century or afterwards, but it ceased to hold an important place in the illustration of the more ambitious works of our professional ancestors. Many writings, however, of great value, such as the contribution of Constantio Varoli to the anatomy of the brain (*De Nervis Opticis*, etc., 1573), the *Historia plerarumque partium Humani Corporis* (1585) of Salomon Alberti, and the artistic treatise *Varia Commensuration para la Escultura y Arquitectura* (1585) of Juan de Arphe were illustrated by woodcuts; but the power that stamped the cuts in Vesal had vanished.

In the seventeenth century copperplate engravings, which had been applied to anatomical illustrations in the previous century by Eustachi, held undisputed sway. The anatomical works of Giulio Casserio (1627), and those of his successor in the chair of Padua, Adrian van der Spieghel (Spigelius), were abundantly and artistically illustrated by this process, after the designs of Fialetti, a pupil of Cremonini and Robusti. Another precious set of drawings

were made a little later by the famous painter Pietro Berrettini or Pietro da Cortona, for the anatomist Johannes Maria Castellanus, and skilfully transferred to copper; but these plates, like those of Eustachi, were allowed to remain buried, and it was not until a century later—in 1741—that they were discovered and published; a lapse that was the more to be regretted on account of the spirit and accuracy of the representations. In the sketches of Fialetti and Berrettini, as in most instances where painters have interested themselves to work for the anatomist, the grimness of the motive disappears under the artistic glamour of vitality, or even of humour.



Fig. 6.—Casseri^{us}, *Tabulae Anatomicae*.

“DISSECTED” PLATES.

A noteworthy feature of the same period was the invention of dissected plates of anatomy, in which the various structures of the body were displayed as far as possible in their natural interrelations by means of overlapping segments of paper, each bearing the outlines of a portion of the surface, or of an organ or set of organs, and so attached that it might be reflected in the natural order of superposition of the parts represented. The idea has been attributed to Johann Rummelin, of Ulm, whose tables first appeared, without his permission, in 1613, under the title of “*Catoptrum Microcosmicum*.” The plan, which was undoubtedly older than Rummelin, was not without merits, and has been utilised, with various modifications, by many authors of later times, but the pictures have generally been lacking in originality and artistic interest. Those of Rummelin offered nothing remarkable in this respect, but his book is of value to the curious on account of the ingenious way in which the draughtsman by masking the female genitals with the

warning face of a demon, and preparing the way for the exposure of the womb by a veil of smoke and flame, from the ashes of an expiring phoenix, has imparted a metaphorical flavour to the scientific details of his designs.

The great landmark of progress in the yet somewhat sterile region of medical science, the immortal *Exercitatio Anatomica de Motu Cordis et Sanguinis* of Harvey, was printed in 1628, but the work owed nothing to the quality of the copper-plates which illustrated it, nor did English art appear to advantage in any of the anatomical publications of the seventeenth century. The plates in Samuel Collins's *System of Anatomy* (1685), executed by Faithorne, displayed less excellence than might have been expected from so able an engraver, and those of a nearly contemporary treatise upon the muscular system by John Browne, a surgeon to St. Thomas's Hospital, have still smaller claims to our admiration.

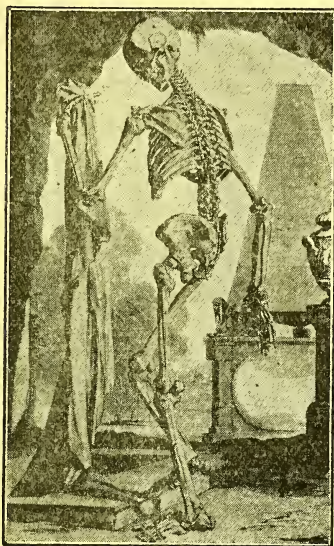


Fig. 7.—Bidloo, *Anatomia Humani Corporis*.

The pictures in the latter case were interesting from the fact that the names of the muscles were engraved upon the parts (a practice which was revived in modern English textbooks by Mr. Luther Holden), but the dissected figures, drawn with pretentious badness, are placed in the most curiously affected and self-conscious attitudes, as though proud of the parade of their anatomical details; and even the claim of originality is wanting, since many are obviously imitated from the earlier and better designs of Casserius. The work, however, ran through four editions, so that it must be supposed to have possessed qualities of more importance than those of mere attractiveness.

BIDLOO AND COWPER.

The palm of artistic excellence in the medical books of the seventeenth century belongs to Holland. The *Anatomia Humani Corporis* of Bidloo (1685), professor of anatomy at the Hague and Leyden, and at one time physician to William III of England, did not add largely to science, but the author took the judicious step of securing the services of an eminent painter, Gerard de Lairese, and an engraver (A. Blooteling?) of almost equal talent, and to the present day his book has remained greatly prized, if little read. Many of the plates, although of astonishing vigour, are too naturalistic both for art and for science, but in two of the osteological designs which are especially remarkable as works of art, the temptation to pictorial allegory was too strong for the artistic mind to resist: in one of these, a figure standing within the entrance of a sepulchre, magnificent even in its fleshlessness, holds up an hourglass as though to warn us



Fig. 8.—Cowper, *Myotomia Reformata*.

that our state was separated from his only by the moments of passage of a few falling grains of sand; and in the other, the animated skeleton is seen retiring into the grave, not without a certain grace and dignity, to escape from a world where the stern simplicity of the unclothed bones could find neither sympathy nor repose. These plates were annexed in 1697 by an English surgeon, William Cowper, to illustrate a work of his own. Cowper had previously published in another volume, entitled *Myotomia Reformata* (1694, reprinted in folio in 1724), a volume containing many curious and well-executed engravings of the muscles and a number of quaint initials and headpieces.

Before leaving the seventeenth century it may be noticed that the two great painters of that period, Rembrandt and Rubens, have left their mark in connection with medical science; Rembrandt in his celebrated picture of the physician Van Tulp demonstrating the muscles of the arm in

the anatomical theatre of Amsterdam (painted 1632), as well as in two other works less known, and Rubens by some bold and characteristic sketches of the superficial forms of anatomy, one of which has been rather ill-produced on copper in the *Myotomia Reformata* of William Cowper.

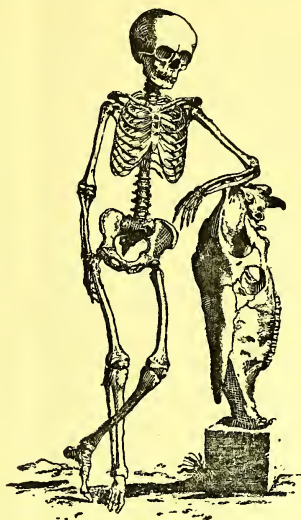


Fig. 9.



Fig. 10.—Cheselden, *Osteographia*.

CHESELDEN AND ALBINUS.

In the next century (the eighteenth) anatomy was dignified by the publication of some splendid anatomical folios, printed in the most sumptuous style and embellished with costly plates and exquisitely-engraved vignettes and *culs de lampe*. How a sufficiency of purchasers could be found for such princely volumes it is hard to say, for the medical profession was not rich, and even the burin of Van der Gucht, of Vander Laar, and of Strange, and the harmonious colour

printing of Ladmiral and the Gautiers could scarcely attract the outside world when employed to depict the details of the dissecting table, yet it is certain that the subscription list was a very substantial one. Practically there was but one method of reproduction during the period comprising the eighteenth and the first twenty years of the present century, and that an expensive one—etching on copper—for the wood block had fallen from its high estate, and gave us no more pictures like those engraved for Guido Guidi and Vesal.

The list of notable volumes is too large even for enumeration, but we may select as specimens for beauty of illustration the *Osteographia*, or *Anatomy of the Bones*, by William Cheselden (1733); the *Tabulæ Sceleti et Musculorum Corporis Humani* of Bernhard Siegfried Albinus, of Leyden (1747); and the *Anatomia Uteri Humani Gravidi*, by William Hunter (1774). Cheselden's work includes, besides the representation of typical human osteology, some characteristic examples of bone diseases, and a number of beautifully etched representations of skeletons of the lower animals. The author, a man of artistic judgment, spared neither trouble nor expense to secure the most artistic reproduction of his preparations, but he was above all a man of science, and as he did not care to risk any sacrifice of truth by trusting to the unaided eye of the draughtsman, he had each specimen drawn under the camera obscura. The result, as may be seen, lost nothing in vigour, and the *Osteographia* is a volume we are proud to number amongst the medical literature of our country. The way had been prepared for this large work by the modest octavo entitled *The Anatomy of the Human Body*, first published in 1713, and which, like its successor, included morbid as well as normal anatomy. It was necessarily a mere outline, but it contained much that was of interest, and the plates, engraved by Gerard Van der Gucht from drawings made with the assistance of the camera, were novel and attractive.

The Atlas of Albinus was a far more scientific and important work than that of Cheselden. Myology had been well and broadly treated in the illustrations to many older volumes, but the minutiae of form, origin, and insertion of each individual muscle were here represented for the first time, and the task was accomplished with so much thoroughness that little has remained for us to add. The drawings of the various figures display great skill and accuracy, and although the engraver has injured the effectiveness of the design by a mechanical hardness of style, and an inability to reproduce the textural character of the structures, he was able to preserve so well the essential truths that the noble atlas fully merits the rank it held during three generations as a standard of reference both for artist and surgeon, and the flattery of imitation that led to the incessant repetition of the plates upon almost every scale up to that of Nature. It was not until near the middle of the present century that its place was taken by other works more suitable to the requirements and pocket of the student. The illustrated volume issued by the same author devoted to the bones—*Tabulæ Ossium Humanorum* (1784)—is especially to be remembered as containing the first attempt to show the exact area of the muscular attachments upon the bones, and the only attempt to indicate in a similar way the ligamentous attachments.

William Hunter's treatise on the Gravid Uterus may rank with Cheselden's *Osteographia* as an ornament to the library, for the best art available at the time had been lavished over a subject that would appear little susceptible to æsthetic treatment. The foremost engravers of the day were employed upon the plates, and one of the number, the famous Sir Robert Strange, is said, in John Hunter's preface to the treatise, to have given "his advice and assistance in every part of the work with a steady and disinterested friendship."

Other examples of anatomical plates embraced within the same period were those illustrating the *Observationes Anatomicae* of Santorini (1724); the beautiful etchings of the *Anatomy of the Horse* by Stubbs (1776), one of the most painstaking examples of anatomical art in existence; the

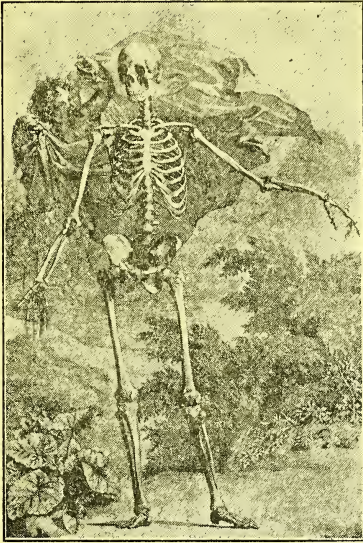


Fig. 11.—Albinus, *Tabulae Sceleti et Musculorum Corporis Humani*.

Icones Anatomicae by Haller (1756); the *Demonstrationum Anatomico-pathologicarum* by Peter Camper, of Leyden, who was an accomplished artist as well as an anatomist and physician; of J. J. Sue's *Elements d'Anatomie à l'Usage des Peintres, des Sculpteurs, et des Amateurs*; Salvage's *Anatomy of the Gladiator* (1812); Van Soemerring's *Tabulae Sceleti Feminini* (1797); Caldani's *Icones Anatomicae* (1801-13); Mascagni's colossal volume of *Universal Anatomy* (1823-32), as well as the useful but not very pleasing pictures in his *History of the Lymphatics* (1787); the bold but coarse and not very exact engravings of the *Bones, Muscles, and Joints* by John Bell (1710); and the less inelegant but still unsatisfactory etchings of Sir Charles Bell published between 1816 and 1833. In conclusion, we may refer to the hideous anatomical plates of Lizars as a work suitable to mortify the flesh, after vain-glorious rejoicing in the splendour of the embellishments bequeathed to us by Bidloo, Cheselden, and William Hunter.

The application to medical and anatomical purposes of printing in colours from engraved copperplates was originated by Le Blon as early as 1721, and further developed by Jan Ladmiral about 1736, and by J. F. Gautier d'Agoti and his son between 1745 and 1773. The process is well exemplified in Ladmiral's plates of the male genitals, and in Gautier's illustrations to Duverny's *Description of the Muscles* (1745).

MODERN PERIOD OF ANATOMICAL ILLUSTRATIONS.

The fourth and latest period may be dated from the close of the second decade of the present century. Art has become more and more indispensable to us as an aid both to record and to explication. The diagram, the more highly-finished drawing or engraving, the photograph, and the model serve as a new language that speaks with strength and clearness where written or spoken words would convey their meaning slowly and imperfectly. The new period has been characterised by an immense quantitative augmentation

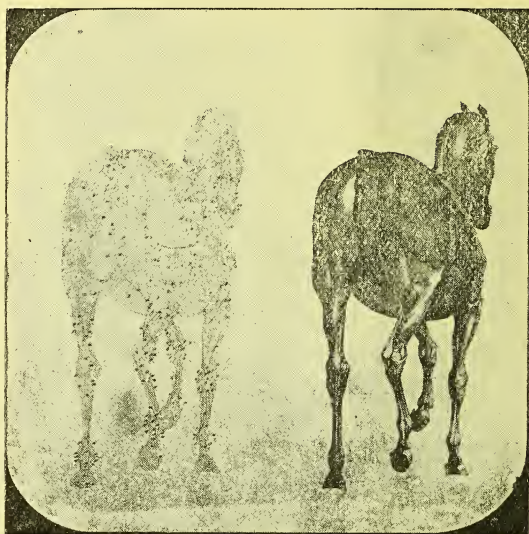


Fig. 12.—Stubbs, *Anatomy of the Horse*.

of illustrations, by the increasing preference shown for diagrammatic clearness over artistic effect in the rendering of anatomical detail, and by the multiplication of methods of pictorial reproduction. We have no Lionardo da Vinci, Calcar, Fialetti, or Berrettini, but the modern draughtsman makes up in comprehension of the needs of science, all he lacks in artistic genius. We can boast no engravings as effective as those of the epitome of Vesal, and even of the plates of Bidloo and Cheselden, or as rigidly accurate as those of Albinus, but we are able to employ new processes that reproduce the drawing or the original object without interpretation, and others that give us useful effects of colour at small expense. Our art is less picturesque but more serviceable and more easy of access.

Engraving on copper, which occupied so important a place during the last period, yielded to cheaper and more readily adaptable processes, but a few specimens of chalcography appeared even as late as the middle of the century. The steel plates, as modified by Warren in 1818, served for works in which delicacy of line was more particularly sought, but the result was not satisfactory. Wood engraving, which had fallen into decay, was revived by the teaching of Thomas Bewick, and placed once more in the forefront amongst the resources of the book illustrator. The colour-printing of Le Blon, Ladmiral, and the Gautiers was replaced by chromolithography, and afterwards by chromo-xylography. Lithography, invented about 1796, was destined to hold an important place in medical illustration. Photography and

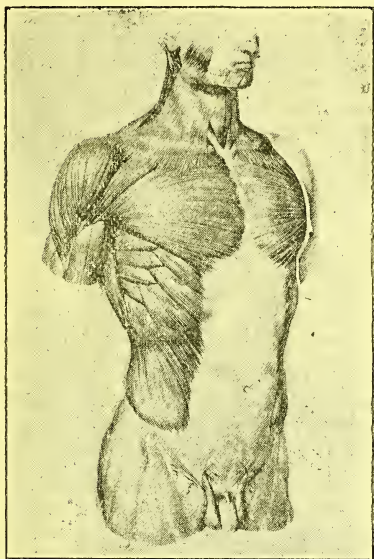


Fig. 13.—Bourgery, *Anatomie Descriptive*.

photographic processes of engraving were found of value where an exact transcript from Nature or from a drawing was especially desirable. Finally, drawing and painting served as before for illustration when immediate multiplication of the design was unnecessary or impracticable, and hand-colouring was employed to lend character to pictures engraved by the ordinary processes.

LITHOGRAPHY IN ANATOMICAL ART.

The first important medical essay in lithography appears to have been the engraved plates of the *Arteries*, published by Tiedemann, in 1822, but the result here was by no means striking. It was not long afterwards, however, in 1831, that Jacob, the father of the modern French school of anatomical drawing, threw a new light upon the possibilities of engraving on stone in the great anatomical work of Bourgery. The less vigorous but more accurate plates executed by

Leveillé, Jacob's favourite pupil, for Fau's *Anatomie des formes extérieures du Corps Humain* (1845) and the nearly contemporary drawings of the bones, ligaments, and muscles for Bonamy, by Emile Beau (1844), fully maintained the reputation of the new manner; but the highest point of excellence was reached by Leveillé's designs for Hirschfeldt's *Anatomie du Système Nerveux* (1853), which has placed France beyond rivalry in anatomical illustration. The best treatise on Artistic Anatomy, that of Dr. Paul Richer, is illustrated partly by lithographic plates, all from drawings by the gifted author, and in this country several good examples of the same method of reproduction have seen the light, some by professed draughtsmen like Ford and Cuthbert, and others by such distinguished members of our own profession as Maclise, Holden, and Godlee.

Engraving on steel, as applied to anatomical pictures, has been less successful, even where the drawings have been supplied by highly competent hands. The best specimens are perhaps to be found in the works of Beraud, in which the hand colouring is particularly delicate.

MODERN WOODCUT ILLUSTRATIONS.

Despite the great development of wood engraving during and since the time of Bewick, there is little that we can show with gratification in anatomical illustration. The work of the artist is usually translated in a more or less ignorant style by the engraver before it is presented to the public; but some exceptions should be pointed out. The cuts by William Bagge, after the drawings by his brother, which appear in Wilson's *Anatomist's Vade Mecum* (1840), are full of veracious expression and artistic feeling, but here the engraver knew his subject. The drawings by H. V. Carter in Gray's *Anatomy*, engraved by Nichols, are admirable examples of clear diagrammatic work, and some of the cuts by Salle in Sappey's *Anatomy* may be noticed on account of their minuteness of detail, but in other respects are distinctly inferior to the works of Bagge. In Germany the atlas of Charles Roth (*Plastisch-Anatomischen Atlas*, 1872), the illustrations in the *Plastische Anatomie* of Kollmann (1886), and those in the valuable work of the late Professor Brücke, *Schönheit und Fehler der menschlichen Gestalt*, may also be noted as good examples of artistic xylography. As a rule, however, the woodcuts illustrating anatomical books do not deserve a large amount of credit for artistic beauty or scrupulous accuracy. A few rise above the level of average excellence, more fall below it, and it is not pleasant to confess that the lowest depths of badness seemed to have been plumbed in two or three works of the present generation published in our own country. Many good cuts—perhaps almost the last of their kind, for the wood block is doomed—appear in the latest edition of *Quain's Anatomy*, and in the large and promising anatomical baby, the *System of Anatomy*, just edited by Mr. Henry Morris.

Chromo-xylography, a process of respectable antiquity—for it appeared on the frontispiece of one of the first anatomical books issued from the press—has been applied to medical illustration only within the last few years, chiefly for the purpose of accentuating the course of vessels in anatomical textbooks; but a higher promise is indicated by the pleasing and expressive cuts in Merkel's *Topographische Anatomie*,

and the still more recent works of Testut, Poirier, and others.

Photographic illustrations from dissections have been employed in a few anatomical works, with results that are distinctly unpleasant to the eye, and not very profitable to the mind, but it is certain that before long the numerous modifications of photographic reproduction of drawings are likely to displace the wood block altogether, on account both of their cheapness and their unerring though unselective exactness.

GLYPTIC ART IN ANATOMY.

Glyptic art as applied to artistic anatomy probably dates from the time when Michael Angelo modelled the muscular forms of figures which he proposed to execute in marble. Becerra, the painter who illustrated Valverde's book on anatomy, is said to have made the first anatomical figure in plaster for the use of artists. Fischer, a Professor of Anatomy to the Academy of Sculpture in Vienna near the end of the last century, was the author of a striking model constructed for the same purpose; and several other more recent examples which may be seen in most of our schools of art have been provided as a guide for students of drawing. Lami, in the present century, was the designer of a well-known figure, to which he published an atlas of plates, and casts have been taken from actual dissections—one, to be seen in the Royal Academy schools, of a corpse in the position of crucifixion, but, as might be expected, the effect is repulsive, and unredeemed by useful qualities of any kind. The best and most accurate examples are, perhaps, those of the small figure known as "Ajax Defying the Gods," and the equine model of Auguste Bonheur.

Sculpture as adapted to the illustration of medical anatomy is of greater antiquity. The figure found in Rome in the villa of Antonius Musa, the physician to the Emperor Augustus, is perhaps the earliest example in existence, but wood carvings of a similar nature have long been employed both in China and Japan. The more serious specimens, however, are of recent date. One of these, still in use, is a complicated life-size model in papier maché, made in Paris, which can be taken to pieces in such a manner as to demonstrate more or less correctly the form and relations of nearly every part of the body, but the idea has been brought into service in a far more scientific manner by Professor His, who by taking casts of organs that have been hardened *in situ* has given us a means of studying the topography of the viscera that is far superior to anything before at our disposal.

Models in wax, *à la* Tussaud, have been in use for many years, and much artistic talent has been employed in conferring upon them a realistic character, which has sometimes been greatly abused in the interest of the proprietors of quack "museums." For purposes of anatomical teaching they have fallen into disuse, although they still supply a want in pathological reproduction.

Finally, a word must be said for the votive offerings of models of affected parts of the body made to the gods in the days of ancient Rome, to accompany a prayer to the gods for aid in sickness or thanks for a recovery accomplished. An interesting account of these from the pen of Dr. Sambon has recently appeared in the BRITISH MEDICAL JOURNAL.

SUMMARY.

The service that Art has rendered to anatomy is sufficiently apparent even in the collection that, chiefly through the kindness of my friend and colleague, Dr. Payne, we are able to bring forward to-day. We all know how indispensable the book illustration has become to fix and clarify our knowledge, and how grateful we are to see it like an oasis in the midst of the desert of text. It is true that pictorial anatomy, like every other good thing, may be misused. It is a poor substitute for reference to the original structures, although for many parts of the body it is a necessary one for the ordinary student, but it is always a very efficient preface and an invaluable sequence for such reference, for it shows us better than any written description what to look for, and it recalls to us what we have seen.

The service that a love of art may confer upon us personally and individually is a matter of a different kind. The study of art is a mental culture of no mean order; it affords a training for the eye that is invaluable to the surgeon, and there is no hobby that can reflect more rays of brightness athwart the dull shadow of the daily routine of our professional life. Happily there are few of us who do not cherish hobbies of some kind, for there are few of those who have them who are not wiser and better for them. Our ranks, moreover, have furnished many distinguished patrons of art, collectors who are known throughout Europe, and not a few amateurs who have displayed a power of artistic achievement that would have made them great artists had not their destiny called them to be eminent physicians and surgeons instead.

Of the use of even a moderate degree of skill in draughtsmanship to the teacher of anatomy little need be said, for it is obvious that he who can flash an idea clearly and pleasantly by a stroke upon the black board will, other things being equal, best hold the attention of his audience and send them away with the best mental picture of the subject of his discourse.

USE OF ANATOMICAL STUDY TO THE ARTIST.

As to the use of anatomical study to the artist opinions are greatly divided. Ruskin, who has done what man may do to elevate art criticism to a science and to embellish it with golden phrases, avers that science is worse than useless to the painter or sculptor, and there is much to be said for this view. As I have endeavoured to show, the greatest and most realistic masterpieces of Greek sculpture were created before the idea of dissection, as we understand the word, was tolerated, and one of the noblest works of Michael Angelo, the "Moses," was that in which his anatomical research was least apparent. Realistic works of a remarkable kind were also done by Egyptian and Japanese wood carvers under conditions which made the practical study of anatomy well-nigh impossible. But, on the other hand, all the greatest artists of the European Renaissance were close students of anatomy, and some of the greatest living artists are as learned as they were. It is not the knowledge but the misuse of the knowledge that is dangerous, and there is no doubt that the pride of Michael Angelo in his anatomical attainments, led him to neglect that close study of the living model which had given perfection to the work of Pheidias; hence it is that the

critic who is dumb before the old Greek may feel compelled to temper his admiration of the Florentine with a regret that so great a mind should have stopped short of the highest goal. That Pheidias attained consummation in art without scientific education proves only that there is no law for the highest genius; the writings of Shakespeare do not tower above rivalry because he knew "small Latin and less Greek," but because, with Pheidias and, perhaps, a dozen other men in the world's history, he rose far above all theories of education. Setting apart such men as these, the greatest artist in art or literature will always express best what he best understands. The wise man is he who knows not merely a fact, but the meaning of the fact, and Science will not fail to stimulate and guide observation when it is not weakened by admixture with an overweening pride in itself.

It may be said that scientific truth in works of art appeals to few. To please the average "man in the street" the artist must tell a story, and must show certain dramatic or sentimental effects and certain tricks of composition, and if he does this his anatomy, his botany, and his geology may caricature Nature, and the picture find admirers and purchasers. The great artist, however, does not labour for the ignorant many but for the few who know; and the greatest work will always bear the most learned criticism, and enjoy the greatest share of immortality.

OBSERVATIONS OF SURFACE FORMS IN ANATOMY.

Lastly, and here for us is the most practical part of this discourse, to which you have done me the honour to listen so patiently, let us consider whether we may not take a hint for ourselves from the artist anatomist. As a technical point, it may be observed that artists have from very early times perceived and represented phenomena in muscular action that anatomists have practically ignored. In fact, the well-trained artist knows far more of the surface forms of the living figure than we, despite the months we have expended in poring over anatomical treatises and in dissecting the dead subject in our schools. Those of us whose function it is to examine the student at the end of his four or five years' work in the dissecting room and the wards, see with sorrow how little the average pass man is able to recognise the meaning of the surface phenomena of the human body, and the sorrow should be the greater because it is the fault of the system which is created and administered by our noble selves. We devote the best hours of our pupils' early years of study to what we call anatomy. He is taught to reflect the skin, to clean the muscles, to define the vessels and nerves, and when all is done, if he has worked well, he may for a brief space be able to recognise any of these structures when they are exposed before him upon a dissection like that which he has made for himself or has seen in the dissecting room, and he will give—from his textbook usually—the main facts relating to them with fair accuracy; but if he ends here he is for ever ignorant of the knowledge that the surgeon and physician should possess, for he knows only the fully dissected anatomy of the corpse and little or nothing of the living normal anatomy of the people whose diseases it is his function in life to treat. His education has

stopped short of the point when it would have become interesting and profitable. I venture to express strongly the opinion that every course of anatomy should include a careful demonstration upon the living model of the relation of every important structure to the surface, and an explanation of every eminence and depression, every ridge and sulcus that mould the elastic skin in repose and in action; that every wrinkle in the skin itself shall be noted and its meaning understood; and finally, that the relation of all these points of observation to physiology and pathology, to medicine and to surgery should be carefully elucidated. Then the student will know what he ought to know, and what he will be able to remember and apply in the practice of his profession.

To effect this reform it is necessary that the examining bodies should do at the anatomical and physiological examinations what is to some extent done in the final examination for the Membership of the College of Surgeons (but not for the Fellowship, where it is even more important)—to institute a special table upon which is a living model, and test every candidate's knowledge of surface markings thoroughly. Then, and then only, would the right anatomy be systematically taught in our schools. It may be objected that the time at the disposal of the student will not permit such an addition to his course; but, if something must be sacrificed, let it be a portion of the time spent in dissection. The ordinary student dissects too much and observes too little, and it would be far better for him to learn his anatomy, as he may profitably do, from parts that have been carefully prepared by a skilled prosector—a junior demonstrator, let us say—rather than from the sad havoc that too often represents his own dissection. He will learn far more in much less time. The candidate for university honours or for the Fellowship of the College of Surgeons may dissect as much as possible, but for the great bulk of our students, those who are to enter general practice, too much time is spent upon the so-called “practical anatomy” and too little upon the anatomy that is really practical.

This prayer for the study of living anatomy is not the first that has been offered up. At the last International Congress in London, Professor Keen, of Philadelphia, a distinguished surgeon and an authority on artistic anatomy, spoke eloquently and forcibly in the same direction, and I recollect that he was warmly supported by Mr. Luther Holden, who is an artist as well as an anatomist; and if my advocacy to-day aids theirs in bringing our teaching a little nearer to the goal of rational anatomy I shall be content.